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BIER Underlay Path Calculation Algorithm and Constraints
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Abstract

This document specifies general rules for interaction between the BAR (BIER Algorithm) and IPA (IGP Algorithm) fields defined in ISIS/OSPFv2 Extensions for BIER. The semantics for the BAR and IPA fields (when both or any of them is non-zero) defined in this document updates the semantics defined in [RFC 8401](#) and [RFC 8444](#).

Requirements Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [BCP 14](#) [[RFC2119](#)] [[RFC8174](#)] when, and only when, they appear in all capitals, as shown here.

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[1.](#) Introduction

In Bit Index Explicit Replication (BIER) architecture [[RFC8279](#)], packets with a BIER encapsulation header are forwarded to the neighbors on the underlay paths towards the BFERs. For each sub-domain, the paths are calculated in the underlay topology for the sub-domain, following a calculation algorithm specific to the sub-domain. The <topology, algorithm> could be congruent or incongruent with unicast. The topology could be a default or non-default topology [[RFC5120](#)]. The algorithm could be a generic IGP algorithm (e.g. SPF) or could be a BIER specific one defined in the future.

In [[RFC8401](#)] and [[RFC8444](#)], an 8-bit BAR (BIER Algorithm) field and 8-bit IPA (IGP Algorithm) field are defined to signal the BIER specific algorithm and generic IGP Algorithm respectively and only value 0 is allowed for both fields in those two documents. This

document specifies the general rules for the two fields and their interaction when either or both fields are not 0, and updates their semantics defined in [[RFC8444](#)] and [[RFC8401](#)].

2. General Rules for the BAR and IPA fields

For a particular sub-domain, all BIER Forwarding Routers (BFRs) MUST be provisioned with and signal the same BAR and IPA values. When a BFR discovers another BFR advertising different BAR or IPA value from its own provisioned, it MUST treat the advertising BFR as incapable of supporting BIER for the sub-domain. How incapable routers are handled is outside the scope of this document.

It is expected that both the BAR and IPA values could have both algorithm and constraints semantics. To generalize, we introduce the following terms:

- o BC: BIER-specific Constraints
- o BA: BIER-specific Algorithm
- o RC: Generic Routing Constraints
- o RA: Generic Routing Algorithm
- o BCBA: BC + BA
- o RCRA: RC + RA

A BAR value corresponds to a BCBA, and an IPA value corresponds to an RCRA. Any of the RC/BC/BA could be "NULL", which means there are no corresponding constraints or algorithm.

When a new BAR value is defined, its corresponding BC/BA semantics MUST be specified. For a new IGP Algorithm to be used as a BIER IPA, its RC/RA semantics MUST also be clearly specified.

For a particular topology X (which could be a default topology or non-default topology) that a sub-domain is associated with, a router calculates the underlay paths according to its provisioned BCBA and RCRA the following way:

1. Apply the BIER constraints, resulting in BC(X).
2. Apply the routing constraints, resulting in RC(BC(X)).
3. Select the algorithm AG as following:

- A. If BA is NULL, AG is set to RA.
 - B. If BA is not NULL, AG is set to BA.
4. Run AG on RC(BC(X)).

2.1. When BAR Is Not Used

The BIER Algorithm registry established by [[RFC8401](#)] and also used in [[RFC8444](#)] has value 0 for "No BIER specific algorithm is used". That translates to NULL BA and NULL BC. Following the rules defined above, the IPA value alone identifies the calculation algorithm and constraints to be used for a particular sub-domain when BAR is 0.

2.2. Exceptions/Extensions to the General Rules

Exceptions or extensions to the above general rules may be specified in the future for specific BAR and/or IPA values. When that happens, compatibility with defined BAR and/or IPA values and semantics need to be specified.

3. Examples

As an example, one may define BAR=x with the semantics of "excluding BIER incapable routers". That BIER specific constraint can go with any IPA: whatever RCRA defined by the IPA is augmented with "excluding BIER incapable routers", i.e., BIER incapable routers are not put onto the candidate list during SPF calculation.

Note that if the BC and RC happen to conflict and lead to an empty topology, then no native BIER forwarding path will be found. That is a network design issue that an operator need to avoid when choosing BAR/IPA.

4. IANA Considerations

No IANA Consideration is requested in this document.

5. Security Considerations

This document does not change the security aspects as discussed in [[RFC8279](#)].

6. Acknowledgements

The authors thank Alia Atlas, Eric Rosen, Senthil Dhanaraj and many others for their suggestions and comments. In particular, the BCBA/

RCRA representation for the interaction rules is based on Alia's write-up.

7. References

7.1. Normative References

- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), DOI 10.17487/RFC2119, March 1997, <<https://www.rfc-editor.org/info/rfc2119>>.
- [RFC8174] Leiba, B., "Ambiguity of Uppercase vs Lowercase in [RFC 2119](#) Key Words", [BCP 14](#), [RFC 8174](#), DOI 10.17487/RFC8174, May 2017, <<https://www.rfc-editor.org/info/rfc8174>>.
- [RFC8401] Ginsberg, L., Ed., Przygienda, T., Aldrin, S., and Z. Zhang, "Bit Index Explicit Replication (BIER) Support via IS-IS", [RFC 8401](#), DOI 10.17487/RFC8401, June 2018, <<https://www.rfc-editor.org/info/rfc8401>>.
- [RFC8444] Psenak, P., Ed., Kumar, N., Wijnands, IJ., Dolganow, A., Przygienda, T., Zhang, J., and S. Aldrin, "OSPFv2 Extensions for Bit Index Explicit Replication (BIER)", [RFC 8444](#), DOI 10.17487/RFC8444, November 2018, <<https://www.rfc-editor.org/info/rfc8444>>.

7.2. Informative References

- [RFC5120] Przygienda, T., Shen, N., and N. Sheth, "M-ISIS: Multi Topology (MT) Routing in Intermediate System to Intermediate Systems (IS-ISs)", [RFC 5120](#), DOI 10.17487/RFC5120, February 2008, <<https://www.rfc-editor.org/info/rfc5120>>.
- [RFC8279] Wijnands, IJ., Ed., Rosen, E., Ed., Dolganow, A., Przygienda, T., and S. Aldrin, "Multicast Using Bit Index Explicit Replication (BIER)", [RFC 8279](#), DOI 10.17487/RFC8279, November 2017, <<https://www.rfc-editor.org/info/rfc8279>>.

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